

Deployment of an Advanced Electrocardiographic Analysis (A-ECG) to Detect Cardiovascular Risk in Career Firefighters

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INTRODUCTION: Sudden cardiac death is the leading cause of line of duty death among firefighters, accounting for approximately 45% of fatalities annually. Firefighters perform strenuous muscular work while wearing heavy, encapsulating personal protective equipment in high ambient temperatures, under chaotic and emotionally stressful conditions. These factors can precipitate sudden cardiac events like myocardial infarction, serious dysrhythmias, or cerebrovascular accidents in firefighters with underlying cardiovascular disease.

PURPOSE: The purpose of this study was to deploy and then evaluate the contribution of resting advanced ECG (A-ECG) in addition to other screening tools (family history, lipid profiles, and cardiopulmonary exercise tests, XT) in assessment of an individual's cardiac risk profile.

METHODS: Forty-four career firefighters were recruited to perform comprehensive baseline assessments including tests of aerobic performance, fasting lipids and glucose. Five-min resting 12-lead A-ECGs were obtained in a subset of firefighters (n=21) and transmitted over a secure networked system to a NASA physician collaborator. Using myocardial perfusion and other imaging as the gold standard, A-ECG scoring has been proven useful in accurately identifying a number of cardiac pathologies including coronary artery disease (CAD), left ventricular hypertrophy, hypertrophic cardiomyopathy, and non-ischemic and ischemic cardiomyopathy.

RESULTS: Subjects' mean (SD) age was 43 (8) years, weight 91 (13) kg, and BMI 28 (3) kg/m². Fifty-one percent of subjects had ≥3 cardiovascular risk factors. One subject had ST depression on XT ECG, at least one positive A-ECG score for CAD, and documented CAD based on cardiology referral. While all other subjects, including those with fewer risk factors, higher aerobic fitness, and normal exercise ECGs, were classified as healthy by A-ECG, there was no trend for association between risk factors and any of 20 A-ECG parameters in the grouped data.

CONCLUSIONS: We have demonstrated that remote capture of a standard resting 12-lead ECG analyzed with advanced algorithms is a simple, time and cost-effective approach that offers the prospect of early identification of individuals potentially at risk for line-of-duty death from cardiovascular incidents.

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